

looking at what the United States is doing, probably around 130 to 140 km. So there is a significant magnitude of difference there. So perhaps, just on that one aspect, there is a need to close that gap, perhaps bridge the gap between water, and bridge it between the other testing parameters.

On the lighter vehicle testing, both Europe and the United States seem to achieve a great degree of compatibility. From my company's point of view, this means that we could gain acceptance throughout Europe but would still have to carry out significant test work for U.S. approval. If successful, this would in essence close the circle worldwide as far as we are concerned for the approval of not only the wire rope safety fence system, but also other barrier systems.

Harmonization can only lead to freer and greater competitive nonconditions for all manufacturers. There is going to be a significant reduction in my company's testing costs, and we will not have to direct our testing toward a specific market, if there is going to be common work throughout and if previous work will be accepted.

The other thing is that it does enable my company to develop safer systems perhaps and things like containment systems, again trying to benefit both road user and people involved in highways.

So manufacturers, designers, and approval authorities probably all have one goal in common — and that is to save the world for the road user. And as far as my company is concerned as a manufacturer, we welcome all forms of harmonization.

#### **IMPLEMENTATION OF CEN AND U.S. PROCEDURES ON A GLOBAL BASIS: THE UNITED STATES**

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Before you can understand the potential implications of the CEN TC226 WG1 harmonization efforts on U.S. highway safety product manufacturers, it is necessary to have an idea of the current status of these manufacturers overseas. I will use Energy Absorption Systems as an example, because knowing how the experiences of the past put U.S. highway safety product manufacturers in the position they are in today will allow us to better predict what will happen in the future after the CEN standards are officially approved.

Driving through any country in the world, one quickly realizes that many of the roadside hazards that are prevalent in one's own country are also routinely found in other countries. These black spots become more evident when kilometers of highways are built near

large cities, thereby losing the luxury of geometries. This is a fact of life in every country in the world.

Many different approaches are taken to correct these black spots, and typically these corrections are handled on a country-by-country or even a state-by-state or county-by-county basis. Before the implementation of CEN TC226, little discussion between countries was ever held regarding the proper way to correct roadside hazards. Some practices were acceptable in one country, but ridiculed in another — a lot of "not invented here" was evident.

Energy Absorption Systems tried to introduce crash cushions overseas and had some limited success. In some countries, crash cushions, although recognized as safety features, were and still are illegal because of a lack of specifications and a misunderstanding of the concept. My company stopped trying to sell a product and started selling a concept: the concept of using properly tested and designed crash cushions to make roads safer. We explained the need for specifications, the evolution of NCHRP Report 230, and why the testing was so stringent. The same basic objections were always present whenever we presented NCHRP Report 230 or the American example:

- The speed overseas is different from the United States.
- The size of cars overseas is smaller compared with the United States.
- People overseas wear seat belts; in the United States we just talk about wearing them.
- The product liability issue is much greater in the United States compared with other countries.
- The "not invented here" syndrome is ever present.

Everyone made it very clear that their country was not the United States. Their conditions were different, and Energy needed to understand their needs and to design the right product. Product modifications were often required. We explained that although the conditions were different, the physics of a crash were very similar regardless of where you are in the world. A properly designed and tested crash cushion would make this crash less severe.

We explained that the size of the test vehicles or the speeds used for testing did not matter; a crash cushion needs to do certain things to be effective. These items were discussed in detail, and we came up with the following key functional requirements: (a) contain the vehicle with no penetration or vaulting; (b) redirect the vehicle; and (c) allow for tolerable impact forces.

This would normally get the attention of most of the highway officials, and we would look at each of these a

little closer. Contain the vehicle means that no matter where the car impacts the crash cushion, the car must be stopped from getting to the hazard. Only by actually crash testing the crash cushion can one know exactly what a system will do when impacted by a vehicle. Energy Absorption Systems has run hundreds of crash tests at its facility in Rocklin, Calif., and we are confident of our ability to predict what our crash cushions will do during a design impact.

The second requirement for a crash cushion is to keep the car on the ground and not allow it to vault or roll after it hits the crash cushion. To achieve this, the center of gravity between the car and the center of applied force from the crash cushion must be maintained. Only through actual testing can one be sure that the car will stay on the ground during an impact.

Next, since many impacts in a crash cushion are angled impacts, the crash cushion must be able to safely redirect the car back into the original flow of traffic or bring the vehicle to a controlled stop. Only by testing the crash cushions with angle impacts can manufacturers and highway officials be assured that the crash cushions will properly redirect a vehicle during an actual angled impact.

Finally, and possibly most important, the crash cushion must reduce the level of deceleration to allow occupants of a vehicle to walk away from an impact that might have otherwise killed them.

It is clear that during a high-speed car impact three impacts are present. First the car hits something, and it stops. This is the first impact. However, for a short period of time the passengers in the car are still traveling at the original speed. During the second impact, these passengers will hit something--possibly the steering wheel or the windshield. If they are in the back seat, they may hit the front seat. It is hoped that they will hit the seat belt. Once the passengers come into contact with the car they start to experience the vehicle's decelerations. During the third impact the forces of deceleration drive our major organs into our chest cavities, causing the internal injuries or bleeding that can kill us. Crash cushions will reduce these levels of deceleration to allow us to survive these impacts.

Every highway agency we spoke to agreed that a system that will accomplish these functional requirements is an excellent safety addition for their highways. They needed to establish some criteria for specifications. Since they often had no specifications, they might use NCHRP Report 230, a modified NCHRP Report 230, the acceleration severity index (ASI), or a visual approval approach or accept a product on a trial basis based on its history. In fact, one European highway authority told me that if any other country in the world accepted a product then that country would accept it.

Having over 15,000 crash cushions installed gave Energy instant credibility.

At times a government, after agreeing to accept the concept of a crash cushion and accepting a set of specifications, did require a few tests to be run in their own country. These can be expensive, but they had to be done. The markets outside the United States are much smaller than U.S. markets, and it is very difficult to amortize the costs of these tests on future sales.

The next step was to get specially priced trial units installed to allow local officials to gain confidence in their effectiveness. This is where Energy is today in 28 countries around the world. Our crash cushions are working and saving lives around the world.

That's today. What about tomorrow? It is clear that the CEN harmonization will affect U.S. manufacturers differently in Europe than in the rest of the world outside Europe.

For the future in Europe, having standardized European specifications that will presumably require one set of tests at a certified test area will cut down costs and clear up much of the ambiguity that highway safety product manufacturers are subjected to today. The specifications must be realistic, and the performance criteria must be based on fact, not just on "the way we always did it," with no substantiation.

Ideally the CEN standards will allow manufacturers to know that if they have a redirective, nongating crash cushion or a temporary barrier, they can test their product to the prescribed tests and have the approval of this product anywhere in Europe. The other European countries will recognize the qualified testing agency's test results. This is an excellent concept, and if implemented properly, it will benefit everyone.

It is very important to any manufacturer that the costs to run tests are kept to a minimum. This should also be very important to any highway authority since the costs of these tests will ultimately be passed on to the highway authorities. Having many testing agencies in Europe will help prevent a monopoly situation and keep the prices at a minimum. It would be even cheaper for a U.S. manufacturer if these tests could be run in the United States to the CEN specification and vice versa. If the United States and Europe form a mutual recognition agreement, the Europeans should insist on multiple crash test sites in the United States to prevent a monopoly situation and to keep their testing costs down. Multiple agencies in the United States and Europe do exist.

U.S. manufacturers must realize that having CEN/U.S. harmonization will have some negative side effects. It will open new markets in the United States for European highway safety products because the entry procedure will be clearer and better understood by manufacturers. This could become a problem, and this

competitive threat must be taken into account by U.S. manufacturers.

It is also very probable that as testing specifications are clarified, allowing Europe to be considered a unified larger market, and the concept of highway safety becomes more popular, more local and foreign competitors will be present in Europe. The presence of local manufacturers will ultimately force foreign firms to enter into licensing arrangements or joint ventures if they want to compete. The freight and duty costs will make it far too expensive to export from the United States.

In general, the CEN specifications will be very good for Europe and for U.S. highway safety product manufacturers who are willing to make a total commitment to Europe. It will not come easy or cheap. U.S. manufacturers will have to relearn how to do business overseas. The tuition to learn may be high but at least the guidelines for success will be clear.

The CEN harmonization will affect U.S. manufacturers slightly differently in non-European countries. In non-European countries, the fact that a product meets both U.S. and European specifications will make highway officials more likely to accept its use in their country. They will more readily agree that the products will work in their road conditions and environment. This will cut down the number of tests and product adaptations that might otherwise be required for safety products, thus reducing the end price. It will be interesting to see if a non-European country that today requires no specifications will someday insist that a product meets not only the CEN specifications, but also the U.S. specifications.

In summary, the CEN harmonization has been, and will continue to be, an excellent opportunity to share experiences gained worldwide regarding the effectiveness of counter measures based on performance, field experience, and cost-effectiveness.

Some questions still need to be answered before the entire harmonization concept is successfully implemented. For example, once these guidelines are submitted to CEN for final approval, I understand that it could be as long as 1996 before they are actually formally approved. What happens between now and 1996? Why not start to use the agreed-on specifications today? In Berlin at the FERSI Conference, the buzz words were "We must start now." I believe this. We should not wait until 1996 to put our hard work to practice. We should not allow one more life to be lost on any road around the world because that country has no formal specifications for a highway safety product. We must put into practice what we have developed and obviously believe.

I am a little concerned about the future. For instance, one U.S. company that was planning to run a

test on a crash cushion in Europe was told to run a test that had never been a part of the CEN test matrix. Why? Because the test was part of the old testing process previously used by this country. In addition, the country that was requiring the test could not determine what performance criteria would be acceptable. This does not make sense. Consistency is critical. Use the CEN guidelines. If you agreed to use them in a meeting room, then start to use them on the test track.

Why wait until 1996 before the test matrix and criteria for barriers and crash cushions are formally accepted? As manufacturers it is very frustrating and costly to run a test that will have no other use in Europe. Why has CEN TC226 WG1 been meeting? Where is the consistency? When will we stop hearing one country speaking and start hearing a unified continental voice?

In a second situation a barrier company was told that each European country can require supplemental tests in addition to the accepted CEN test matrix for a barrier or a crash cushion and that a country can decide that a temporary barrier must be tested as a permanent barrier, even if it is to be used only as a temporary barrier. Where is the consistency? This does not make sense either. Why make the classifications if no one will use them? Are the CEN specifications European specifications or simply guidelines for European countries to pick and choose from at their will?

Many people have put in a lot of time, work, and effort into this harmonization process. It has been very worthwhile, and people's lives will be saved because of this work. However, if this harmonization is to be totally effective, every country that signs that piece of paper must be totally committed to the process.

Highway officials in each country must be willing to give up some of their authority for the overall benefit. This is the only way that the separate entities in Europe can successfully act autonomously as a single body. Everyone must be ready to consistently follow the written rules regarding the acceptance of tests done at approved test sites and be willing to accept the approved service levels. This consistency is critical. If this does not occur completely, the resulting confusion and uncertainty will make marketing conditions for both U.S. and European safety product manufacturers very miserable.

Having a set of written rules that are not uniformly enforced will create an even worse situation resulting in higher cost products, a more difficult acceptance of the products, and an all-around unacceptable condition. Consistency is key and critical.

However, if the countries in Europe can work together as a single entity, and they can, the benefits to committed manufacturers from this harmonization process will be tremendous. We must start now.